What is claimed is:

1. A method of manufacturing a fluoride crystal comprising:

heating a fluoride starting material in the melting zone of a growth furnace having a melting zone and a cooling zone to a temperature equal to or greater than its melting temperature to form a melt;

growing a fluoride crystal from the fluoride melt by cooling the melt from the melting temperature to a first temperature below the melting temperature by lowering the melt from the melting zone into the cooling zone and controlling the temperature of the two zones so that the temperature difference between the two zones is minimized during crystal formation; and

annealing the crystal in the cooling zone by cooling the crystal from the first temperature to a final temperature at a substantially constant cooling rate;

wherein the fluoride starting material is selected from the group consisting of calcium fluoride, barium fluoride, magnesium fluoride and strontium, including mixtures thereof.

2. The method according to claim 1, wherein the starting material is calcium fluoride.

3. The method according to claim 1, wherein the first temperature is the range of 1300 °C to about 1100 °C.

4. The method according to claim 1, wherein during crystal growth and cooling to a first temperature the temperature difference between the two zones is less than 50 °C.

5. The method according to claim 1, wherein the final temperature is the range of 300 °C to approximately room temperature.

6. The method of claim 1, wherein the substantially constant cooling rate is less than or equal to approximately 3° C/hr or less.

7. The method according to claim 1, wherein during cooling from the melt temperature to the first temperature a decreasing fast cooling profile is applied to the melting zone and an increasingly slow cooling profile is applied to the growth/annealing zone to diminish the temperature difference between the two zones.

8. The method according to claim 6 and 7, wherein said method produces a <111> calcium fluoride single crystal having a diameter of 250 mm or greater with an average homogeneity of less than about 1.5 ppm and a birefringence of less than about 0.4 nm/cm.

9. The method of claim 6 and 7, wherein the method produces a <111> calcium fluoride single crystal having a diameter of 250 mm or greater with an average homogeneity of less than about 0.9 ppm and an average birefringence less than or equal to about 0.32 nm/cm.

10. A <111> calcium fluoride single crystal of 250 mm or greater diameter or greater with an average homogeneity of 1.5 ppm and an average birefringence of less than 0.4 nm/cm,.

11. The crystal according to claim 10, wherein the average homogeneity is less than 0.9 ppm and the average birefringence is les than 0.32 m micron.

12. A <100> calcium fluoride single crystal of 250 mm or greater diameter or greater with an average homogeneity of 1.5 ppm and an average birefringence of less than 2 nm/cm,.